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TABLE 12. FULL PAPER: CHINA

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Telling 10 Symbols 1

Estuarine bivalve goes <i>By Richard M. Smith</i>	53
Tree structure and ship frames	
The factors in the house	38
Aviation left aviation faculty of some problems	
Thunder bird's nest <i>By E. Paul Anderson</i>	40
The eight articles of a writing an aviator	
Rolling snow runways	42
Rolling runway in snow	
Progress of aviation law <i>By George W. Douglas, Jr.</i>	43
Radio comes to the aid of the student	45
Radio comes to the aid of the student	
The equipment of air forces <i>By Karl Wilson Stewart</i>	16
The work of a writer, that when you read	
The problem of aviation	58
The problem of aviation for a double article	
Editorials	51
Editorials	
News of the Month	54
News of the Month	
Flying Equipment	58
Flying Equipment	
Service Short Cuts	62
Service Short Cuts	
Aircraft at Work	63
Aircraft at Work	
The Bureau's Log Book	64
The Bureau's Log Book	

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* PARADOX *

THE AIRPLANE today presents a paradox.

It is our most modern means of transportation. Yet in this machine age of production-line manufacture, many planes still are built a few at a time by hand methods. ★ Obviously, this retards the progress of air transportation. Lower flying costs are needed—lower costs for operation, inspection, servicing, maintenance and part replacements. And these lower costs can come only from the greater safety, durability and dependability produced by modern, straight-line machine manufacturing. ★ That is why the Martin plant is, in fact, two plants—one devoted exclusively to the building of single, experimental planes; the other to the manufacture of planes of approved design by the most modern, accurate machine-production methods. It is our sincere conviction that somehow else in the industry

we should be able to produce as many such

Glenn L. Martin

The Glenn L. Martin Company

Baltimore, Maryland, U. S. A.

BUILDING OF DEPENDABLE AIRCRAFT SINCE 1909

Retractable landing gears

Their advantages and their design for landplanes

By Richard M. Meck

THOUGH retractable landing gears for landplanes have only come into popular use in the last few years, the idea is by no means new. In 1894, Ford and Graciot patented a design of an airplane which had a front landing chassis of the wheel type and a tail wheel all retracting into the fuselage to reduce the air resistance. However, as far as can be learned the idea never took a practical form until after the War, when Dayton-Wright built a high-wing, single-engine monoplane for the 1920 Gordon Bennett race with the wheels retracting back in the sides of the fuselage. The year before, Lawrence Sperry built an amphibious flying boat which is believed to have had the first practical retractable gear.

However, these were special purpose planes. On normal civilian and military planes of that time the drag of the landing gear was regarded with the tail drag of the airplane was not sufficient for a retractable gear to give enough increase in speed to overcome the additional complication. For the next ten years the problem seemed little altered. Today most high-speed planes are "clean," so that the landing-gear drag is a greater proportion of the total. Thus, the gain by the substitution of landing-gear drag is likely to be greater, though the value of tail wheel correction is still doubtful.

As a rule, where the ground arrangement allows a reasonably efficient retractable landing gear it has been found that, compared with a similar design with fixed wheel type undercarriage, the speed is increased only 3-4 per cent at 130 m.p.h. Because lower planes are generally cleaner the increase grows to 4-7 per cent at 150 m.p.h. and at 355-370 m.p.h. to about 10 per cent. One well-known low-wing design had a high speed of about 375 m.p.h. with a seven-fuel, six-cylinder gear, while with the landing gear fully extended the speed was increased about 25 m.p.h., or 14 per cent. It is possible that an eight or 10 per cent increase in speed might result at 355-395 m.p.h. from retracting the landing gear on a very clean design. On designs where the wing bracing is combined with a streamlined landing gear, as on many low-wing racers or the Bolinder Arcton, the gain due to retraction would of course be doubtful.

At the speeds achieved today the exact relative merits of the streamlined conventional gear (whether or not it is part of the wing bracing) and the retractable type depend much upon the ingenuity of the designer and the purpose, type and size of the airplane.

Speed

On some types insufficient space is available in the wing or fuselage to retract the landing gear. Practically

for high speed flight it is believed better to increase the frontal area slightly to provide the needed space. Thus all parts are concentrated into one mass that can be given the best possible shape, rather than have a number of separate units with the accompanying interference between them and the possible disturbances where they meet. This problem is closely tied in with problems of stress to break the wheels and will be discussed later.

Weight

An increase in speed with the same power means less flying time, hence less fuel and oil required for a given flight distance. The saving in weight of fuel and oil goes to offset the additional weight of the retracting mechanism, linkages and accompanying increase in structural weight.

As an example might help to illustrate this point. Assuming an airplane having 8,000 lb. gross weight, 3,000 lb. netted load, and cruising at 150 m.p.h., the addition of a retractable mechanism might increase the weight roughly 50 lb., and reduce the netted load by the same amount. The fuel consumption might be assumed to be 35 gal. and oil consumption 3 gal. per hour, or a total of 380 lb. per hour. A 14 per cent increase in speed would reduce the time for a given flight 25 per cent, saving 95 lb. of fuel and oil per hour (roughly

ing that slightly smaller wheels could be used. Therefore for a 480-mile flight, if this increase in speed is achieved, the additional weight of the retracting gear would have no net effect on the pay load. This would be typical, whatever the size of the plane.

In general a fixed landing gear weighs 4-9 per cent of the empty weight of the airplane or 10-14 per cent of the useful load, though this may vary as much as 7-10 per cent. A retractable gear increases the landing gear weight 18-20 per cent, reduces the useful load 1-3 per cent. Airplanes of about 10 ft per ft landing use 7-11 per cent of their useful load per hour in fuel and oil.

Thus, with a decrease or change the additional weight would be offset by the fuel and oil saving if the speed were increased 1-2 per cent. For a two-hour flight, a 15-Mph per cent increase would be sufficient.

Cost

Outside of the greater value of a faster aircraft, an increase in speed often means that fewer planes are needed to keep a given frequency of schedule. In addition, the fewer planes in service give a diversion in cost, meaning a reduction of all costs proportional to flight time, such as fuel and oil, flying costs, baggage and maintenance and overhead of airplane and engine.

Consider a conservative approximation of the additional expense due to a retractable gear. Assuming that the initial cost of the retractable landing gear is \$300-\$1,500, depending on the size, type and purpose of the plane, it will be an additional cost of \$100,000 to \$1,000,000, depending on the size of the airplane. Though some operators claim a retractable gear is a "pay-off" investment that a fixed gear is, with maintenance, some an additional maintenance cost of 3 cents to 10 cents per flying hour, while a fixed gear costs an additional expense of 10 cents to 40 cents per flying hour.

Though a cost which reduces the insurance costs would not be necessary, it seems reasonable to assume a flying hour increase of 1 to 2 per cent in both earth and passenger liability insurance. From the Post Office Department letters, air mail represents 6.5 per cent of the total operating expense. Crash and passenger liability are assumed to constitute about 40 per cent of the total insurance or 2.6 per cent of the total operating expense. If this were increased 1 to 2 per cent due to the retractable gear the total increase in operating expenses would be only 0.026 to 0.052 per cent.

Using the most probable figures within the above ranges in each case, and adding an imaginary plane of roughly up-to-the-minute design and an accordingly low cost operating cost, the following table shows the increase in cost due to the addition of a retractable gear. (Only



Right side of landing gear of the B-29-51 built without high-wing monoplane. The gear extends backward about 18 in. and forward through the upper ends of the shock absorber and air flow doors. The upper ends of the shock absorber and air flow doors are in the lower fuselage. A note to the left of the gear is an electrical diagram which shows the gear is in a normal position. It is shown in a normal position. The note in the center shows the gear is in a normal position. The note in the center shows the gear is in a normal position.

portion of the "direct operating expenses" are directly proportional to flying time so only 20 per cent is used.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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The factory

Airplanes built without

EVERY new and then someone writes in to *Aviation* to tell us that we are failing to give the home-built airplane its due. We knew that to some that family we devoted there might be something in it, and we went out to investigate this home-made airplane thing and find out what it all amounted to. We wrote to everybody who was listed as having learned or planned within the past year to make an airplane that didn't appear to be a factory product, and a large proportion of those to whom we wrote answered. The photographs and captions on these pages are a part of what we found out.

Rapidly speaking, identification numbers have been issued in the past year for 225 planes of this class. Many of these have never gone beyond taking an identification number, and as closely as we can estimate about one-third of them have reached the point of getting off the ground. Approximately one-half of those that fly are built from the plans of one of three well-known types—Horch, Pietenpol, or Chorch. About all whether built from purchased plans or from home designs are monoplanes



Above: E. A. Tabbell over a four-cylinder engine in his airplane made up at Cherry, Parkville, Cincinnati, and other parts.

Right: A modified Plymouth design for two persons has been built by David Swanson. The engine is the Ford Model A.

Below: The Chorch motorcar design has been modified by C. A. Tabbell and is powered by the Chorch Mustang engine of 41 hp. Construction is conventional.



Left: A four-cylinder engine is being designed by E. A. Tabbell in the personal automobile design at Parkville, Ohio.

Above: A stream-lined motorcar has been prepared for the converted Ford Model A engine in the C. A. Tabbell design.



Above: Robert Dow has designed his airplane around the 5-cylinder, 27-horsepower Wright Monocraft engine. Weight four tons permits a speed of 5 mph.

in the home

benefit of mass production

and most are highway monoplanes. Not many of the machines have any very unusual characteristics, but a number show real competence and real care in detail design. Some, on the other hand, are plainly so badly out of balance that it is easy to understand why they are never flown, or so badly over-weighted as to suggest that lead pipe must have been used for the main structural members.

Some of the amateurs are deliberately doubtful of the industry's product and one of the most active of them writes to us that they are "mad red-blooded young men who never would dream of buying an airplane so long as they could build one."

Monoplanes are scattered in type, but very few of the builders have had the formal ability or the inclination to log airplane designs, even of the simplest size. About half of the home-made machines have modified motor-cycle pontoons, while most of the rest depend on engines scavenged from Ford. In that, in its other aspects, the photographs that we show are good typical examples of the best that home construction has to offer.



Above: The entire low wing, with the 40 hp. Holman A10 engine has been made over the 100 hours. Fourteen had wing area of more than 100 sq. ft.



Above: A 10 hp. Henderson monoplaner engine is used in the Holman low wing.



Above: The Chorch M14 Wing built by E. A. Tabbell is powered with the two cylinder Mustang.



Above: R. E. Pietenpol whose design is familiar in the White Star, requires a converted Model A Ford engine, a wood and fabric wing and a plywood and fabric fuselage.



Right: A modified North Fordard North-Henderson 12 hp. engine has been built by C. A. Tabbell. Wood and fabric are used in construction.

THE RIGHTS OF A SERIES ON MAINTENANCE

Thunder bird's nest

Observations at Pan American Airways' Brownsville base

By S. Paul Johnston

Aviation Editor of Aviation

ONE cannot help but wonder how far into the future the second Central American peoples really are in retaining their fantastic legends of Quetzalcóatl, the feathered god who rode the winds. For they believe, chiefly the days when tropic winds would glint on silver wings high over tumbled jungles of Yucatan, or when frigate gulls of the air-sweepable Mountains of the Sun would participate in the piloting of a thousand men made birds? What frenzied applications might not stem from such a crumbling temple ground could but the leonard people of a thousand years ago where the shrouded passing of Pan America's thunder birds?

Consider the topography of the P.A.A. routes from Brownsville to Tampico to Mexico City, to Tapachula, to Managua, El Salvador, down the continental divide to Panama. There are no railroads to follow, no continuous pattern of towns and villages with ready communication facilities, no integrated air-sea-going governmental agencies to provide flighted signals and weather information services, isolated, hundreds of miles of trackless jungle and rapid, snow-capped ridges 15,000 ft. above the sea, tremendous areas between population centers whose habitations are figured on the bases of a few acres of a house being per square mile, weather which varies in a single hour's flight from the dark atmosphere of the low back to the blinding fog and blazes of the mountain, and last, but not least, the negative influence of a string of politically disaffected Central American supplies. It is against such odds that the fly-into divisions of Pan American operates. Therein lies the rehabilitation of the super-meritism stations given to the flying equipment at Brownsville.

In this present issue of articles on maintenance, the midway legends, centralization has been painted and Brownsville has been made dramatic

maintenance base although the route extends southward for a distance almost as great as that between New York and Chicago, Wyco. Located on two flying days away from the home port, it is common on domestic airlines, the ships which make the long haul to the Coast Zone and back are away from Brownsville for at least four flying days (usually six or seven calendar days). This, together with the fact that three divisions meet at Gratiot, necessitates a more elaborate repair base at Panama than might otherwise be necessary, and introduces a degree of de-centralization within the division itself.

The installation and maintenance of all flying equipment at the Wyco division is as well as the direct supervision of the entire shop at Brownsville, in the hands of R. D. Sandell, division engineer. With the exception of radio (which cannot under the control of the division maintenance supervisor, Mr. Sandell is responsible also for all field and shop equipment in Mexico and Central America). The general administration of the division is handled from headquarters in Mexico City by an interested engineers and engineers referring to maintenance personnel the division engineer reports directly to Mr. A. A. Pomeroy, chief engineer at New York City.

Wasp powered Vultures maintain the backbone of the flying equipment in Western division. A few P-47s and P-51s and P-52s make regular trips to and from the active base, but they are distributed at several points along the low fly emergency service only. One of the P-47s is maintained at Brownsville for emergency flying instruction. The student pilot's unit is included in ground plane activities to provide for flying conditions.

Engine servicing

On the long Coast Zone run «back» represents about fifteen hours flying

time from Brownsville to Gratiot, a complex turning check is given each engine at the enroute stopping point, and the regular Pan American «loop» servicing is given at Gratiot. This includes: (1) 80 post-run checks, (2) check oil levels, (3) remove and inspect front spark plugs, (4) lubricate and inspect lower for valve clearance, etc., (5) remove and clean gas valve trimmer, (6) check rear spark plugs for tightness, (7) check water mixture, (8) remove and lubricate push rods and (9) clean engine thoroughly. On the return trip to Brownsville the same items are checked, but in addition the following work is done: (1) change engine oil, (2) change spark plugs, (3) check magnetos for wear and oil clearance, (4) remove and clean carburetor air plugs, and flush out carburetor, (5) remove and clean all gauges and all trimmers. Any particular difficulties noted in flight by pilots are also taken care of.

Airplane routine

Airplanes follow about the same schedule as the engine. Flight activities are given all day, and all day, along the line, and a fifteen-hour complete inspection of all external and internal systems, controls, tire pressure, etc. This is repeated but somewhat less thoroughly at Brownsville. The procedures with regard to airplanes follow somewhat less strict laws than that each airplane is practically overhauled at periods corresponding with engine overhaul intervals. This is not merely a superficial inspection but frequently involves the pulling off of engine nacelles, tire surfaces, landing gear, wing tip sections, and all configurations of the aircraft are thoroughly examined for corrosion or cracks, and any doubtful parts or rivets are immediately replaced. Cabin furnishings including chairs, floor boards, and cur-



Close-up view of short-wheel department and airplane overhaul shop. Both clean and orderly appearance, which is the rule and not the exception.

tain screens of the wall painting are removed completely at frequent intervals, and all parts required reconditioned and polished. Any parts of the upholstery which are actually worn are replaced. At the same time external items come out and go in the shop for corrosion and overhaul, and all radio equipment is pulled and tested over to the communications division for check and overhaul. Loose or damaged wiring is repaired and all landing and other sheet metal parts are repolished or spot-buffed. Ships come out of overhaul with all the cosmetics of factory finish.

Engine harnesses are pulled after each day's run, and are held for changing at stop-over points. All harnesses, therefore, crumble up and down the line, but sooner or later pass through Brownsville where complete search is kept. B.G. IXA spark plugs are standard equipment. They are pulled at Brownsville at about 40-hour intervals when they are disassembled, cleaned, checked and tested for firing under pressure. An impressive testing apparatus has been devised at Brownsville (quite made standard for all Pan American shops) which will be described in the "Service Short Cuts" section at a later time. One man is responsible for all spark plug work. About 100 plugs a day go through the shop.

Pilots are inspected at every stopping point. At intervals intervals they are examined, more carefully for cracks or damage from stress or run, and the last crew and radio are checked. They are pulled at engine overhaul intervals for complete inspection and overhaul, which includes disassembly, cleaning, magnetos examination, trucking, pitch-setting and balancing.

Paint layout

The plant at Brownsville is housed in two standard Pan American Airways double-ended hangars, each with a single-story house along one side. They are located in the municipal field (operated by Pan American Airways) about 350 yd. south of the terminal building which houses waiting rooms, ticket office and general administrative personnel. Each hangar is similar to the ones used at Denver, Key West, Miami (see "Checking Out the Grounds," AVIATION, July, 1952) in accordance with standard P.A.A. specifications, roof, sidewalks and doors are covered with 3/4-inch concrete protected metal.

The more northern hangar is devoted to routine servicing of airplanes. A small shop at the standard runway is given over to the radio section for equipment servicing and parts storage. The principal line is a so far service

side and houses the division engineer's office and the general storeroom. An auxiliary bus has been built along the main side to enable air-transport equipment, the recently installed radio transmitting station, and washrooms. The other building takes care of all overhaul activities. The main hangar floor is used for assembly and disassembly of planes, with the sheetmetal shop occupying a considerable portion of the area along the southern wall. Updatery and window-glass replacement is handled in the southeast corner. A stair to this section a door leads out into the washrooms, which is located in a small building external to the hangar proper. The engine overhaul, the machine shop and the propeller overhaul shop are situated on the line in on the main side. A Stinson oil reduction plant is installed in a small detached building behind the hangars.

Plant "housekeeping"

Special mention should be made in passing of the general condition of all shops and equipment at Brownsville. In few plants are such high standards of cleanliness and good housekeeping maintained. Special racks or stands designed for the storage of all equipment which is not in use, and unusual items are taken to keep floors, benches, and areas around

GREAT BRITAIN (PART TWO)

The equipment of air forces

By

Maj. Oliver Stewart

IN THE previous article dealing with Great Britain's services we suggested the system adopted in building up service demands with the view of the aircraft industry was outlined, the guiding principle which here influences decisions in the selection of aircraft and engines for the Royal Air Force were indicated, and some of the individual types of machines were described. It will now be possible to outline the examination of the several types of machines and of the policy and the aims which have brought them into existence.

Intelligence fighters are types of single-seater pursuit airplanes developed especially for the defence of London. They resemble everything to performance and powers of maneuver, and carry fuel for less than two hours flying. The type is the production of purely local conditions, of the kind of problems that *defending* pilots would have to solve if England's capital were to be attacked by air, but the intru-

ceptor has many advantages as an ordinary pursuit machine and apart from increase of fuel capacity little else needs alteration. The steel work too, as will be described later, the interceptor class can readily be made available. Strengthening of the fuselage structure for absorbing, and recovery of wing area to give an appropriate wing loading for deck landings, are the only major alterations demanded. The leading interceptor fighter is the Bristol service at the present time is the Blenheim Fury with Rolls-Royce Kestrel engine.

This Fury, which is a wing-braced biplane, and is the aircraft with the highest performance in series production for the R.A.F., was developed in the last article and its performance figures were given. In accordance with the Air Ministry's custom it can not select from drawings but after actual comparative trial against other aircraft. There were several other aircraft considered for this class, but the only one that came near to duplicating the Rolls-Royce Fury was the one that was the Fury. The Fury also with the Rolls-Royce Kestrel

engine, and also an externally braced biplane of about 32 ft. span. It has been used in quantity by the Belgian air force, more than one entire squadron being equipped with it.

Between the Fury and the Finlay machines there was little to choose, and it was more a matter of personal predilection on the part of the judges than anything else that decided the issue, for the Finlay and the Fury both have their special points and are both of these machines capable of exceptionally high performance with light engine load. Constructional methods differ and there are points of difference in the general layout, the most important being the use in the Finlay of high aspect ratio airfoils on both top and bottom wings while on the Fury airfoils are said to be the top wing only. It is claimed that the use of airfoils on both wings gives superior powers of maneuver, especially at great heights where lift falls off.

The Finlay has an adjustable outboard, and is a machine of wide requirements such as the placing of the guns, the two machines differ. The performance figures are little room for choice. The Finlay, fitted with a propeller chosen for class speed gives a maximum speed of 212 miles an hour at 15,000 ft. and of 203 m.p.h. at 20,000 ft. With a climbing propeller it reaches 19,700 ft. in eight minutes six seconds if the supercharger is brought in operation, while its speed with this propeller at 15,000 ft. is 200 m.p.h.

These figures give an idea of present requirements in the R.A.F. for the interceptor class but there are also the leading fighters and the leading bombers. Both the Fury and the Finlay have a wide speed range and are comfortable enough to be used at an approach speed of 75 m.p.h., while the normal landing speed is much lower. They are suitable of all the conditions and their performance enables new ground to be gained to some of the interceptors. For example, a roll may be performed as the machine takes off, and height



Right: Blenheim Fury is the one used in the Bristol Fury. It is a new design machine for the R.A.F.

Courtesy of "Flight"

gained in the process. Two complex turns of a vertical upward spin are possible with any speed for a great previous accumulation of speed through descent.

The weakness are steady in terminal descent when speed of more than 400 miles an hour are reached.

In view of the present idea in countries outside Great Britain that terminal descent is not less part of the training program for British aircraft, it is worth mentioning that actual speeds of more than 400 miles an hour in terminal descent with the Fury and the Finlay have been recorded on many occasions by test pilots and that all prototypes are submitted in the doing test, and a descent are demonstrated in the test.

Ease of handling

Altogether the Royal Air Force believes that it has in its interceptor fighters aircraft which show a notable advance on any previous type and which are capable of out-performing an aircraft that could be brought against them by any other air power. Moreover, it is confident that this exceptional performance has been obtained at a cost which is the second lowest in the history of the British air force. The Finlay and Blenheim are perhaps the most easily handled single-seater fighters that have been considered in the R.A.F. and the latter is well-spread among pilots in England that there are at present no other military aircraft in the world which embody as much such high performance with such modest powers of maneuver and such easy handling qualities as the Rolls-Royce Blenheim Fury. (Obviously this is open to argument, but Wayne Stewart is proceeding, as we demand, the British point of view.—E.)

The R.A.F. recognizes that of military aircraft has a fairly remarkable to the continental model machine. It is a high-speed machine, with as

substantial functions of carrying a crew and armament but always in the background. High speed, high rate of climb, good power, if maneuver, these are the three essentials to which everything else is subordinated.

Discrepancy comes between the nature of the world, while they are likely to affect the equipment of air forces, are not likely to affect the interceptor class so much as the other classes because it comes present in being purely defensive. Owing to its limited maneuver and its general layout, which demands the suppression of drag in all its forms, the interceptor would be greatly handicapped by anything but its particular kind of climbing up and attacking, making attacks. It could not be used with any great success for attack upon ground targets, because the weight of projectiles it could carry would be insignificant.

It is, may you leave the single-seater class and pass to the day bombers. These again in the Royal Air Force today the standard bomber has been able to retain a reserve margin in the design to against the officers who would place military requirements first with the result that aerodynamically the day bombers, like the latest-day fighters, are satisfactory and the performance high.

In the R.A.F. a sharp line of distinction is drawn between the day and the night bombers. The day bomber is usually not so fast always single-engine as it is always of the wing-braced biplane type, it carries a small load of bombs, perhaps only 500 lb. with full range for the night engine machines and rather more than double this for the heavy engine machines. In the single-engine day bomber has been developed in the day bomber is once more, as high powers of maneuver, and the

left: A reconnaissance in service. American practice is noted in the new British Blenheim bomber now used with Kestrel and equipped for long range. If needed Blenheim is almost suitable for attack and the one cannot but be fitted with

Training of "Flight"



and he is provided with a gun nacelle with some special mounting intended to protect him from the opponent. The type in the single-engine machines has been found for long forward through the field except by the pilot, or the nature of the two types of a single-seater fighter or interceptor.

Day bombers

Representative of the two types, in the bomber now in use in the R.A.F. are the single-engine Blenheim Fury with the Rolls-Royce Kestrel engine and the two-engine Blenheim Fury with the Bristol Kestrel engine. The Blenheim Fury has been found for long forward through the field except by the pilot, or the nature of the two types of a single-seater fighter or interceptor.

It is not intended here to enter into this controversy, which is one I doubt if will as long length as a previous article in *Aviation* but it is worth recalling that the problem shows no signs of being easily solved. While the single-engine day bomber has been found for long forward through the field except by the pilot, or the nature of the two types of a single-seater fighter or interceptor.



Left: The Blenheim Fury, a development of the Bristol Fury, is the standard day bomber in the Royal Air Force today. It is a single-engine machine with Kestrel engine, the Bristol Fury, with the Bristol Kestrel engine.



Courtesy of "Flight"

Bootham & Paul. Subsequent two to be moved, raised and flown upside down, so that in combat it is not necessarily out-of-control by the fighters.

The Shrike Horn is soon to be in squadrons of the R.A.F., and its squadron is equipped with the latest modified as a two-seater fighter and renamed the Dromedary. The Horn is also used for Army co-operation work: a branch of its operation often called reconnaissance in other services, (or observation in the Army), and for Army Spitfire and reconnaissance work under the names Aphid and Ophion.

In the presence of the Air Ministry to meet aircraft according to function as well as design, so that the Horn appears to be the Horned and the Horn at the same time, the Aphid, and the Ophion. Change of aircraft equipment brings with it change of name. The Aphid has been criticized as coming to resemble the design lines of the aircraft. Modification of the aircraft so that it may perform specialized duties does not seem to be the basic design. That remains the same for all variants, and so it offers the opportunity for a measure of series production which would be unobtainable if basically dissimilar types were chosen for each duty.

The Kestrel engine

Before leaving the interceptor fighters and day fighters something must be said about the Kestrel engine, which forms the power unit for both the Fury and

the Horn and their descendants, and for many other new R.A.F. machines. The Rolls-Royce Kestrel is a twelve-cylinder, super-charged 60 deg V type engine. As delivered to the R.A.F. in day, it gives 560 h.p. at 13,500 R.p.m., but by the addition to the fuel of a small quantity of trimethyl lead the supercharger can be brought in at ground level when, at normal revolutions, 2,250, its output at 710 h.p. is obtained and, at maximum allowed revolutions, 2,700, its output of 660 h.p.

It is to be noted that the fuel specification for the R.A.F. gives no octane number at about 70, although the Air Ministry is preparing to raise this by stages to a rating near 90. [The same level of octane number is given.] Another point is that engine light cooling is not used in all of the standard R.A.F. machines. The only change from air and water cooling is likely to be to supercharge, (or "boost"), cooling. This has been tried in the new four-cylinder Gloster troop carrier, the Vickers four-cylinder fighter and in other aircraft.

The Kestrel engine is not top-cooled at all, and the present general overhaul interval is set by the Air Ministry at 500 hours. There is a likelihood of its being further extended for certain classes of work on the new fighters. The Puma and Horn have shown that they can do more than 500 hours flying without showing any signs of requiring structural modification.

and there is a very small engine experience to estimate the life of their "airframes," which is the word adopted in British aviation to mean the airplane structure as distinct from the engine and from the complete machine.

The "Horned"

Both the remaining classes of R.A.F. machines to be dealt with are in the heavy group, the night bombers and the heavy bombers, but before turning up the present position in Great Britain and also dealing with the heavy classes, a few words will be said upon the training aircraft.

All types of heavy bomber in use in the squadrons at the present time are withdrawn lightly with pilot housed forward of the wings, one gunner in the nose, one just aft of the wings and, for protection against attack from below and to the rear, one either in a turret on the underside of the fuselage or in a special cockpit at the extreme tail. Positions for the bomb aimer very slightly, but the position forward in the nose of the fuselage with some arrangement to permit a front view downwards and the mounting of bomb sights forward of the wings, are gunner in the nose, though experimental aircraft with three and four engines have been produced. The location of this type is accepted as being chiefly sight attack on ground objectives; but it may also be called upon in emergency for conversion of troops and agents.

The heavy bomber at present in use in the R.A.F. squadrons are of three types, the Handley Page Hercules, the Handley Page Victor, and the Vickers Valiant, and all three of them are subsonic. Indeed it is to be pointed out that the R.A.F. is most backward, the country types being slow and inefficient when judged by modern standards.

At the same time new machines have been built experimentally and one



The Short R 1010 (Puma) has a general view of the R 1010 (Puma) bomber, which is the latest and most powerful of the type in Great Britain.

View of Puma

small radial engine and a piston engine, 7,000 h.p. Three type subsonic aircraft are used on both wings and also are used in the upper wings in the R.A.F., multi-engine aircraft. The value of cost in the torpedo carrier is particularly high because a small aircraft is required to carry high speed down here to be made and then there is possibility of a high speed and through the means of the centrifugal compressor. This means that the machine's stability under such conditions.

Flying boats form a class in which the R.A.F. has specialized an account of the value of establishing one-on-air communication in a standard Empire line. The first of the British Empire flying boats which were built under the R.A.F. and do not have part of the Naval Air Arm. The first widely used flying boat is the four-engine, a production of the Supermarine works which is now a branch company of Vickers. The Blackburn Zna is the largest flying boat in the world, built by the Blackburn Works, which is now a branch company of Vickers. The Blackburn Zna is the largest flying boat in the world, built by the Blackburn Works, which is now a branch company of Vickers. The Blackburn Zna is the largest flying boat in the world, built by the Blackburn Works, which is now a branch company of Vickers.

An offshoot of the heavy bomber is the bomber transport which, as the name implies, doubles the work of heavy bombing and troop and agent carrying. The two R.A.F. machines equipped with this type have the Vickers Valiant, and the Gloster Gladiator, which produced a four-engine bomber transport with which it is hoped the Valiant will be replaced later on. The value of these heavy transport machines to the R.A.F. has been demonstrated during the disturbances in Cyprus and in Iraq and the British air staff is at present inclined to press forward with development of the type. The Gloster has four engines—two Bristol, two Bristol—Kestrel engines and the wing span is 65 ft. The all-up weight of a troop transport is 20,000 lb and the operational height is from 12,000 to 15,000 ft. It may be added that the Puma heavy bomber is comparable for use as a troop transport when it can take either two or twenty men. The Puma's total weight is rather over 41,000 lb.

Fire and fire power

Other features of the Handley are the position of the fuselage above the wings, the top wing, the aircraft being to achieve interference with the main fuselage and the wings, and to give the view of the last possible view, and the fuselage undercarriage which is incorporated in the bottom wing. The wheels are located in a recessed down for approximately three quarters of the diameter of the wheel and carrying one wheel on the lower wing. Such structures are also entirely enclosed so that no part of the undercarriage is exposed other than the wheel axles, which serve with the wings and a segment of the lower part of each wheel. The lightest form has been chosen in this case to keep down to a minimum the projected area for windage, to pick up as much and to give the highest possible degree of maneuverability consistent with the load carried.

Both the Handley Page Hercules and the Puma machines which are

produced in the same form, include many details features of interest, among them the arrangements for the gunners. There is the remarkable "last bar" turret in the Handley Page and there are the "disappearing" positions in the Puma. The "last bar" turret is a cylindrical metal housing located at the lower end and containing gun and sighting and a seat for the gunner with a sufficient aperture to fire through. The housing is retractable and also movable, the rotation being done by hand wheel by the gunner while at his post with the housing left down in the "active" position. The gun mounts in the Puma are hidden away when not in use in the fuselage down at the bottom.

An offshoot of the heavy bomber is the bomber transport which, as the name implies, doubles the work of heavy bombing and troop and agent carrying. The two R.A.F. machines equipped with this type have the Vickers Valiant, and the Gloster Gladiator, which produced a four-engine bomber transport with which it is hoped the Valiant will be replaced later on. The value of these heavy transport machines to the R.A.F. has been demonstrated during the disturbances in Cyprus and in Iraq and the British air staff is at present inclined to press forward with development of the type. The Gloster has four engines—two Bristol, two Bristol—Kestrel engines and the wing span is 65 ft. The all-up weight of a troop transport is 20,000 lb and the operational height is from 12,000 to 15,000 ft. It may be added that the Puma heavy bomber is comparable for use as a troop transport when it can take either two or twenty men. The Puma's total weight is rather over 41,000 lb.

Torpedo planes

A class of aircraft which came between the heavy bombers and the day bombers is represented in the R.A.F. by the Handley and the Vickers Valiant. These are torpedo aircraft and they are used in four squadrons. The Vickers Valiant has the Bristol Puma air-

craft is particularly high because a small aircraft is required to carry high speed down here to be made and then there is possibility of a high speed and through the means of the centrifugal compressor. This means that the machine's stability under such conditions.

Training

Before concluding this survey of British service aircraft something must be said of training machines and training policy. It was it was time thought that, for training the service pilot, a



Right: The new short-haul transport aircraft, the Short R 1010 (Puma) has a general view of the R 1010 (Puma) bomber, which is the latest and most powerful of the type in Great Britain.



View of "Puma"

harmful. The best general rule for the individual is to oppose everything new about which he feels the slightest doubt.

Transport

1. Steps for agreement on optimum operating conditions. Progress here has been as rapid as could be expected. Certainly there is a much closer approach to agreement on what constitutes a good transport plane and a good operating operation now than could have been found a year ago. This can be crossed off the list as requiring no special attention in 1933.

2. Higher and better traffic surveys. On this point, the second is not so good. A number of individuals have been entrusted to do good work on the analysis of actual and potential passenger and express traffic, but cooperation has been scanty. The Air Transport Section of the Aeronautical Chapter of Commerce has had no more important business than to find out just what sectors of the American public is traveling by air, just what it wants the matter with the other services.

3. Agree on a policy towards the air mail. Little has come down on this point in the last year ago, so this item would have to go to the very top of a management team made new. The air mail has had splendid support from the public for several years, but it still has plenty of foes in Congress. A new administration is about to arrive in Washington. Air transportation ought to be prepared to offer the goals of its campaign by meeting the new Postmaster General with a definite program of a long-range development of the air mail service, and with definite proposals for a policy which will keep the industry in the strong position to which it has been brought, and also provide for a gradual reduction of the Post Office Department's net outlay. We believe that the American Congress and the American people are quite prepared to go along with the air mail and support its development as long as necessary, but it is only reasonable that they should want to have some very definite idea of where they are going. The operators, who alone have the knowledge and experience to formulate such an idea, ought to do their best to give it to them.

4. Cooperation on routes. A year ago the Railway Express agency represented the only attempt at co-operation, and it included less than a third of the country's transport services. The formation of General Air Express within the past year has brought an noticeable improvement. Some independent staff exist, but they play a minor part. Taking the nation as a whole, the air express business now has a perfectly proper organization, and all that is needed is a harmonious relation between the two main agencies and a simple arrangement for the exchange of inter-line traffic between them. This need no longer be reckoned as a problem of the industry.

5. Cooperation for insurance. There is some progress to

report under this heading for 1932, but not enough. There is still too much duplication of effort. There are still too many cases in which each airline runs its own transportation facilities to the airport, its own ticket-selling facilities, and its own general air travel promotion work, in apparent disregard of the very existence of other lines. There have been some notable instances of cooperation during the past year, but we need more and better ones. The committee is one of the main points to emphasize in 1933.

6. Work on the reduction of noise. At least one operator and two or three manufacturers have taken this matter very seriously indeed, and have gone after it in an entirely new spirit. If they and others will carry on as vigorously during the coming year as during the one just ended, we shall soon be able to appeal to sensitive travelers to forsake the railroad for the airline on the grounds that the airplane is much less disturbing to the cars than the train.

Manufacturing

1. Free within our means. Nothing more needs to be said on this score. The defense of the airplane industry is complete. With the most equipment facilities are adjusted to present-day production, and method of operation is waiting for the needs of the day, as an insurance turnover they have recognized to make a profit on gross volumes as small as those of five or six years ago. It uses a powerful operator, but a necessary one, and it is virtually finished.

2. Make the product fit the market. This remains exceedingly important. Airlines are still too generally led by terms of the point of view of the highly skilled pilot, without enough regard for the feelings of the ordinary man who might become a purchaser. That mistake doesn't apply universally, and certainly progress has been made, but there is still occasion for a bit of driving into the mind of the average business man and into his relations towards matters aeronautical. There are about a hundred thousand people in the United States who could well afford to maintain airplanes, but who have no apparent thought of getting any at the present time. There must be some kind of an account that will reach a substantial proportion of these people. It is up to the industry to find out what kind of a machine will do the trick, and then to build it. The steady pressure to expand the customer for existing types are all in the good, but relatively speaking too much effort has been expended on selling the public the idea of using existing aircraft, and not enough on finding out whether or not it would be possible to produce a machine upon which a certain section of the public could be sold more easily.

3. Control production at the source. The situation on production statistics is, if anything, worse than a year ago. Reports are so slow in appearing as to be of almost no value in the industry's planning. Such

reports may seem of relatively little value with last year as such as it is now, but they will become immensely important as soon as there is any change for the better. Now is the time to start a policy of weekly exchange of full information upon work completed and work in progress, in order that the exchange may be making smoothly by the time the steel for it becomes urgent.

4. Stop selling at a loss and

5. Stop price operations on stock plans. Except for a few dealers, and still fewer manufacturers, this is closed up. The desperate campaign of endless price-cutting which began characteristically over our heads from the beginning of 1930 to the beginning of 1932, no longer applies. The responsible people in the business fully realize that there is no sense in bringing about general ruin. The industry has had its lesson with desperate selling on a basis of price-cutting, and we believe that the lesson has been given adequately (see last).

6. Develop an industry policy on the regulation of commercial design and construction. Under most of the previous subjects under the general heading of manufacturing, this one still calls for attention. The industry is still full of people who say that this does not and the other thing ought to be done about government regulation, and then harshly add "but don't open me!" With a new administration approaching it is particularly important to the manufacturers and users at airplanes to decide whether it is so their interest to have an official maintenance of the present policy, or to have more regulation or to have less. Whatever they decide they must be prepared to suggest their decision with strong arguments, particularly if they want a reduced amount of regulation in opposition to the general governmental tendency to extend and tighten its grasp on everything which it has once touched. Furthermore, it does no good simply to say that there should be less regulation. That isn't a policy, but a profession of faith. The people who offer it must go on to say just where the amount of regulation can be reduced and how it can be done without danger of harmful results. They ought not to delay any longer in making up their own minds on the matter.

7. Share of the use of aviation in industry. This, like the co-operative traffic survey, is recommended for the transport lines, and awaits attention. The Chamber of Commerce would have engineers and Aviation has dug out so many records on possible remitted cases of airplanes, but the need for a really comprehensive study still exists. It will cost money, and the industry will have to provide the money, but if it is intelligently undertaken it cannot fail to open up new markets and to provide a bit of new selling arguments for use in markets already known to exist.

8. Give operators an incentive to use planes. Some progress has been made here, but not nearly enough. The counties of the Aeronauts Air Pilot's Association

have been splendid indications of what can and should be done. Special aviation routes, such as those recently organized at the Boston Airport, are additional stimuli in the wind. To make private ownership stand forth while it is really large number of operators, however, there must be as true as much activity as has been stimulated up to the present time.

9. Get more complete laws. On this score it is only necessary to say that it is still as important as ever, especially from the point of view of encouraging private ownership of aircraft, and that no progress was made during 1932. We still have practically a clean sheet upon which to write the record of organization of American non-flying factories.

10. Cooperation in foreign markets. Here, too, there has been practically no progress though the relative importance of export trade perhaps looks larger than ever before. American companies have gone after that trade with great energy, but they have had to juggle their sales organizations overseas, and to dispense a substantial part of their effort in competing with each other. Federal law specifically recognizes the pecking of effort and of results in foreign trade as proper and desirable. The focus of the American aircraft industry centers in foreign markets upon the industries of Great Britain, France, Germany, Italy and various lesser states. It is quite enough of a job to do that with out having to work against each other in the same time. We believe that it would be definitely in the interest of the American industry to arrange for a definite pooling of foreign trade effort and action among the leading groups of producers, at least for certain markets or in certain parts of the world. There is no present prospect of acceptance of any such sort-out of commercial effort as would enable America to present a united front against Europe, but we continue to hold it as one of the most important planks in our platform, even though it happens to occupy the last place in our arrangement.

THAT leaves exposed what we consider a reasonable plan for 1933. By the beginning of 1934 no doubt the time will be ripe for a complete reworking of the whole structure of recommendations. There are urgent problems still before us, and some of these will still be there at the end of the present year. It is, however, a reasonable index to the increasing seriousness with which the aircraft industry has studied its own place in the world, analyzed its own problems and studied the task of finding a solution that out of about 30 items, which seemed important enough to be apparently mentioned a year ago, were given a third can be considered as having been completely closed up during 1932, while at least two-thirds show substantial progress in the right direction. Perhaps there has been no previous year in which the industry has shown so marked an improvement in forward-looking outlook, or so great a gain in the substantiation of plans considered for immediate uptake.

from the Chinese government in 1945-46, when an unofficial American mission arrived to help moderate Chinese governmental affairs. Designed for training use, these fleets are replicas of the Model 7, and carry 125 hp. Komar engines. Meanwhile, the Japanese bombers which inflicted destruction on Shanghai last spring have been transferred to Jidok, province of northeastern China. There, they give almost daily proof that they have lost nothing of their voracious efficiency.

The Republic of Colombia now is difficult to visit from over the treetops of Leticia, a possessor of a large long-range flying boat from the Consolidated company. Powered with two general Wright Cyclone engines of 700 hp each, its cruising speed is an estimate of 160 miles an hour. Fuelage for 1,200 gallons of gasoline gives the big plane a range of about 1,600 miles without refueling. It was so accident on Long Island where test flights were made, and is now being carried to its new home.

American engines on the Continent

Most recent direct penetration of the Carver-Wright Corporation has been in the European continent. Whirlwind engines of 585 hp power the ATR-72 tri-jet plane recently ordered from the aircraft factories of the U.S.S.R. by Dnepzr, just 60 miles from Ukraine's border with Poland. The aircraft is being placed in service on the Warsaw-Moscow route. Four are still under construction, to be delivered shortly. All aircraft constructions and similar in external appearance to the Ford transsonic aircraft that the whirling engine transmits in the leading edge of the wing. The aircraft has two passengers in a crew of two at a cruising speed of 1,380 miles per hour.

A Wright engine is the first of American design to receive an airworthiness certificate from the British Air Ministry. Granted to Canadian Wright Ltd., of Montreal, agency is the British Empire for the Wright Aeronautical Corporation, it appoints the same cylinder Wharfman set a rating of 300 hp at 2400 rpm. The engine, which has undergone tests in the laboratories at the Aeronautical Division of the National Research Council in Canada, is positively identical with the model recently rated by the U. S. Department of Commerce at 350 hp.

Development approved

An approved type certificate has been issued by the Department of Commerce to the Bordenair 178. The Booth Aircraft Company of Wichita, Kan., expects to go into production immediately on this model (described on page 468 of the December 1933 issue) the first example of which recently won the Transoceanic race at Mexico.

Treatments completed with the



ANOTHER CURTIS PURSUIT FOR THE ARMY
 Armed with a 105-hp Lycoming Constant-Speed light-cooled engine, the YF-40 is heralding performance in the air. It is the first Army pursuit plane to be equipped with automatic slats and flaps. There may be several other aircraft in the off.

[illegible]

A new Service Information Bureau has been opened by the Nicholas-Brenneman Appliance Company in connection with its eastern branch at Flood Barronville. Service and flying organizations can obtain first-hand information regarding the cost of material necessary, complete specifications overhauls and repairs on any type of plane.

via Detroit, Alaska

Dick, the chairman of a United Court appeal remains to get the same Detroit Aircraft Corporation back on the list of insured manufacturers. A plan for reorganization of the company, which has been in territorial since last spring, was unanimously approved by the stockholders at a special meeting in Detroit on Dec. 29. A new corporation under the old name will be organized. It purchases at a preferred sale the assets of the old company. It will have authorized capital stock of 250,000 shares of one dollar and no value to it.

offered in the ratio of one new share for each ten shares of old stock, of which 1,334,131 shares are outstanding. Chief engineer of the new company will be William B. Mayo, formerly chief engineer of the Aircraft Division of Ford Motor Company. Peter R. Rosen, who has been president and in charge of operations of Detroit Aeronaut for the last twelve months before its reorganization, and former chief reorganization plan, will be general manager.

New Navy plans

Among recent arrivals at the U.S. Naval Air Station at Anacostia, were a Great Lakes-style plane designated NSG-1 and a fighter from the Buffalo plant at Curtiss Aeroplane & Motor Co., a former LaSalle School, in Evanston, Chicago. The latter is a highly sophisticated Whig James engine. Like the LaSalle, some upholstery defuncted and demounted some weeks ago. The NSG-1 has numerous parts missing, but is scheduled for a preliminary flight attempt by mid-July. The aircraft is to be added back and secured in the hall for storage on arrival at its destination. The Curtiss fighter with Wright R-1310 two-row radial engine, is undergoing service tests. It is the Board of Inspection, two and three.

Twenty-seven two-seater fighters, based on the XFP-1 which has been undergoing service testing for some time past, have been ordered from the Grumman Aircraft Engineering Corporation by the Navy Department. First deliveries are scheduled for June. This is the first production order of the Grumman company, which recently took over the erstwhile American Aircraft & Engine plant in Farmingdale, L. I.

Under the agreement recently awarded to the Standard Oil Company (Kintade), Stanaco distributor in Florida, 1,310,000 gallons of Stanaco gasoline will be distributed to eleven rural co-

EVOLUTION
 February, 2023

relations between New Jersey and Florida. Gasoline to be supplied is largely Standard American Gasoline (not referring to more specifications for 74 octane fuel) (50-800 gallons are Standard with Elflet, octane 90-92, 87).

Marines take a trudge

[illegible]

Germany's new stroke

Early in the summer the world's largest-assembly field will pass to the 12-129, now naming completion Pfaffenlocher, Germany. The new transport is a bare eight feet longer than the Alouette, presents little bulkier, and is 10 ft. longer than the Grol Zepplin. Its passenger accommodations will be considerably more spacious than those of the Grol, and will be entirely separated from the navigation room. Four diesel engines of 1,000 hp. each propel it. Both the Maybach and MAN firms are building engines, and only after tests will it be decided which type will be used in the 12-129. Use of diesel engines offers a saving in fuel consumption sufficient to allow an increase

of about half a ton or useful load on the voyage from Europe to South America.

French Navy recruitment solution

The speaker then asked the French Air Ministry how had it succeeded in its mission in the loss of control of coastal waters. The French Navy had all other matters, it feebly opposed its separate air forces. Under Paul Puaud, mathematics took hold of the present Air Ministry, a strange wheel of fortune group. In September 1932, when the Ministry was first formed, it had been dominated. The Navy was arguing, ended one possible all its economical activities and the execution of manufacture and governmental work in airplane design. Since a Ministry of Air is not only included in the new government, the

Parley: is entrusted to his old post as my head of the hosts of the French press that the final disintegration of the AD Ministry is at hand even refunded. No change in the handling of land base relations is involved. In France as in the United States and most other countries, the Army is much less hostile to the idea of a separate, autonomous organization than is the Navy.

Germany's international exchange rate

Problems arising among temporary recruits for the current fiscal year, the city of Garmisch-Partenkirchen reports a slight enlargement of applications over the situation of the previous year. Though the total estimations for the fiscal year ending March 31, 1933, show only a slight increase some stems, notably the "economic promotion of the German aviation industry" or subsidies for manufacturers are up more than 50 per cent. The transport subsidy to Deutsche Luftlinien, though still the biggest item on the books, is about 2 million and a half marks, or 8 per cent below the previous year's figure. A reduction of some 300,000 marks made its way through to the German Aeronautics Research Institute at Adolphshausen, which has the testing equipment and workshop alone.

Alind findings by Lophoceros

In connection with the opening of training school for pilots at Tomsell Aerodrome at Herby a course for the landing recently developed in the Luftwaffe was demonstrated. It also demonstrated a pilot in the closed cabin of an unarmored transport to the proper position which a landing could be made assuming a clear ceiling of only 200 ft. This was accomplished in the real

himself landing his attack, gave me further than that. Some of the Jewish methods were used by Capt. Albert I. Hegensberger last summer in blind land mine tests in which he was alone in the

plane with its cockpit completely hooded. New landing beams seem to be installed by the Department of Commerce not only guide the pilot to the field, but give him a directional angle of glide to follow directly to the ground regardless of visibility.

Parameters

Capt. George W. Saele, commanding officer of the aircraft carrier *Barnegat*, was relieved of his command on December 14 to permit his attendance after 20 years of active service. First commanding officer of the *Los Angeles*, he was one of the first group of American naval officers to make a flight across the Atlantic in a rigid airship. He came over in the *Los Angeles* when a German submarine was reported near Luluaburu Coast, South F. Zoegelman, commander of the Naval Air Station at Pensacola will refer over his command.

Capt. Fred T. Berry, new command officer at the Naval Air Station at Lakehurst, N. J., is talking command of the Royal Airship Training and Experimental Squadron of the U.S. Navy and also of the Lakehurst station. Lt. Cmdr. Jesse L. Kenworthy Jr., succeeds him as executive officer of the station.

retiring Chief of Staff of the Air Ministry, and served Air Vice-Marshal Sir Cyril Vyvyan in April as general staff director on the board of the Imperial Airways. Upon his retirement from the Air Force, commandant last July (Autumn, September, 1932) last just about to take effect, Sir John will be succeeded by his elder brother, Air Marshal Sir Geoffrey Salmond.

With the completion of reconstruction work at the Aeronautical Research Institute of the Tokyo Imperial University Dr. C. Shiba, who has been promoting this work for the past nine years, has announced his resignation as director. Dr. Kienan Wade, professor at the Imperial University and acknowledged as international expert, has been appointed his successor.

F. Trumbo Dorrance, Assistant Secretary of War in Charge of Aeromarine, has been elected president of the American Museum of Natural History to succeed Prof. Henry Fairfield Osborn. Dr. David S. Yule, Director, will resign the post in which he was appointed by the late President Coolidge in 1926, to give

Major Jack Berry, manager of Cleveland Airport since 1926, has tendered his resignation, to take effect immediately. Claude F. Ring will be acting manager until permanent arrangements can be made.

E. K. Campbell, long associated with Curtiss-Wright, in various capacities has been appointed manager of sales and service in the Transport Division of the Curtiss-Wright Aircraft Company.

FLYING EQUIPMENT

The new
Condor transport

THE new Curtiss-Wright Condor transport for 1933 (one of which was under construction at the Robertson plant), now three prototypes removed from the Army's heavy bomber category, has shaken all the earmarks of its military ancestry. Up to this point the transport has been gradual. The first change involved alteration in fuselage dimensions, to provide cargo room, leaving area of gun cockpit to the middle, and the introduction of dihedral to improve lateral and directional stability.

The second and third steps left the primary structure basically unaltered but were concerned chiefly with a general streamlining and cleaning up of the exterior (including complete revision of fuselage shape) and, more important still, the building in of certain features to improve maintenance facilities, and to lower operating costs. The 1933 model, the third step, is a decided variant—a new off-shoot of the Condor family but completely redesigned, it is a partly conventional type built to meet military or transportation requirements. Except that it is a replacement with two engines, completely redesigned to meet military requirements, and that it incorporates maintenance and passenger comfort features painstakingly developed during the past ten years of active service in Eastern Air Transport, Inc., the resemblance to the older models is not very pronounced.

Externally, the most obvious change concerns the power plant, the landing gear, and the tail surfaces. The first is probably the most noticeable. None of the Condor, the Condor—bomber transport—has been built around the water-cooled Curtiss Conquest engine. The underlying reason was probably a desire to maintain all the power in two units which, with the relatively acute entrance of air-cooled engines into the lighter horsepower ranges, precluded this.

Two of the latest Cyclone P-1 of 400 hp each are tied on the new Condor. General models were selected to reduce propeller tip speed (and therefore, propeller noise), and to increase propulsive efficiency. Large diameter three-bladed metal propellers are fitted. The engines are mounted in streamlined nacelles of the B.A.C.A. type, located in accordance with the latest recommendations from Langley Field, with propellers in line with, and well ahead of the leading edge of the lower wing. This puts the plane of rotation well



Photograph of a model showing appearance of the new Condor in flight.

ahead of the passenger compartment, an important point with respect to stable nose and passenger safety.

An extremely simple gravity type fuel system, said to contain only 36 fittings, has been laid out for the ship. The engine is carried on four 75-hp trestles in the center section of the lower wing, and is fed by gravity down to the distributors. Fuel may be used from any tank in either engine, and the fuel systems have been simplified to simplify refueling operations.

Modern high-speed transport requirements call for extensive loading gear (for a general discussion of the economics of loading gear see page 33 of this issue), and the new Condor is not lacking in this respect. The main wheels are loaded below each engine, and may be withdrawn to flight into the undercarriage of the fuselage. The retractors are not complete, as about one-half the diameter of each wheel remains exposed

to the sky/struts. All axles and landing struts, however, are completely loaded. Normally the retracting mechanism is operated electrically, but for emergency hand-operated mechanical control is provided. Thus separate warning devices are installed to indicate the position of the gear to the pilot. The two sets of the low-pressure safety load type, and the wheels are fixed with mechanical brakes. The tail-wheel is not retractable, but is furnished with spring-loaded fairings. As shown in the accompanying three-view drawing, the machine may be fitted up as a tugboat by the substitution of two tow-bars in place of the wheeled gear.

One of the distinguishing marks of the old Condor was its high-set tail and double rudder. These features have been discarded in the new machine by the substitution of the more conventional single horizontal and vertical tail surfaces. The old idea that the vertical tail surfaces of the tail must be kept to the tip-streams of multiple power plants has been generally abandoned. On the new Condor both the vertical and horizontal surfaces are of high aspect ratio, as dictated by current practice. It is of interest to note that some portions of the P-18 type have been incorporated, both in the rudder and in the elevators. Dynamic balancing of the outer hinge type has also been used, and all retractable surfaces are hinged on ball bearings, both for ease of control and for reduced maintenance costs.

With respect to structure, the new ship is of the conventional wing type. The fuselage is welded up from aluminum-aluminum and tubing. Wing boxes are of box-truss welded steel, and the ribs of aluminum alloy. The main portion of the fuselage are covered with doped fabric. A great deal of attention has been paid to the accessibility of the exterior structure by the proper location of removable panels, and inspection windows. The same is

one of the novel features. Every essential part of power-plant or landing gear is reached for inspection in a minimum time. Electric wiring throughout the ship is run in metal conduit with shielded junction and fuse boxes.

The pilot's compartment in the new is fitted with the full complement of head frame attachments, all rubber-covered. Radio receiving and transmitting apparatus is to be placed in the cockpit behind the pilot's seats. As in previous models, the fuel controls are fixed on a V support from a single column mounted between the seats. The passenger seats are fitted with seats for three persons, arranged in a single row along the side, and are also close to the ether, with an aisle between. The cabin is not subdivided into compartments as was done in the first ship produced by Eastern Air Transport. Normally all seats face forward, but some of the seats may be reversed if desired. The exterior is finished in a combination of fabric and buffed metal, with leather-covered floors. Radiator pipes



Ground position of Condor showing engine arrangement, location of baggage compartment.

are provided at the bottom of the wall to eliminate sharp corners, and the floor includes entrance a short distance to the wall. This feature, together with fixed type door lifts, permit easy descent, and prevent the accumulation of dirt in corners. The windows are of laminated glass and cannot be opened. Other ventilation is handled and supplied from a central system. The ground control is in the hands of the pilot, but individual controls permit each passenger to adjust her own comfort. Hot air supply at her seat is set on low flame. Since no gasoline is carried in the fuselage proper, the possibility of burning from this source is entirely eliminated. Great care has been expended in protecting the walls. The cabin is virtually as near leakage tight, separated from the outer shell by large air spaces, and suitable sound-proof padding.

The new Condor has a wing span of 82 ft. and a gross weight of approximately 14,500 lb. of which 3,200 lb. is available as payload. It is expected to show a high speed of about 170 miles an hour, and a cruising range of about 140 miles an hour. Its normal load capacity of 300 gallons gives it a possible range of about 500 miles.



A Fokker F-2A biplane in flight with landing gear retracted.

Fokker builds
high-speed transports

THE active development of a number of high-speed transport designs by the Dutch Fokker Company (of which the first unit will go into street duty on K.C.M.) weakens the assumption that European operations are no longer confined to 300-mile an hour sailing speeds, but have been advanced to the possible economies of the 180-200 m.p.h. range now being reached by their American counterparts. First to be designed will be a three-engine machine, capable of carrying 20 to 25 passengers at a cruising speed of 135 m.p.h. Top speed of 180 m.p.h. is predicted. The model can also cruise ranging from 200 to 400 p.m.h. The first machine is being built with three 700 hp Wright Cyclone P's.

In general arrangement the F-2A is typically Fokker, but exhibits a number of innovations. The standard welded steel tube, fixed control surfaces have been retained, although the old retracting gear mechanism has been changed in favor of an approximately elliptical form. Outboard engine nacelles have been dropped well below the wing, and are supported entirely from the wing structure, there being no bracket members to the fuselage. The landing gear is attached to the nacelle only and is completely retractable. The main wheels can be pulled up into the nacelle and the operators controlled by hand with electric power, or the air may also be entirely withdrawn into the nacelle. N.A.C.A. cowlings are fitted on all three engines.

Dependent on the stage desired, the cabin may be arranged for 22 or 20 passengers. Some 210 or 180 of baggage space is available, distributed between the fuselage and several wing compartments, each of which are forced back into the main span, and located close to the rear of the trailing edge of the wing. A number of other modern air transport designs and construction types: The P-36, a four-engine (Cyclone) monoplane for long range work with alternate cabin arrangements—six with chairs for 37 day passengers, and the other with convertible sleeping ac-

commodations for 16 day and night passengers—has also been ordered by K.C.M. Besides these, there are under way a smaller high-speed transport for 10 passengers, a high-speed single-engine transport for 10, and 6 passengers; and a two-engine design about which very little is known to date.

General Aviation's
Clark GA-48 transport

A BIRD of many feathers through its varied maintenance and high sailing speed is being made by the Clark designed GA-48 transport by General Aviation Manufacturing Corporation. The new machine is a low-wing monoplane, with a full metal monocoque fuselage, fitted with retracting landing gear. It is powered with a single Wright Cyclone E or F (12 P.H.W.) However, it may also be built, not has seats for 16 passengers and a pilot.



Low down while a GA-48.

The metal monocoque fuselage has a smooth skin of Alclad, riveted to Z-bar struts, supported on leading structural wing-type bulkheads. Wing ribs extend about 13 ft. beyond, and are an integral part of the fuselage. The principal struts are carried on two diaphragm bulkheads, one being a central section with struts, which carry the load across the fuselage through the bulkheads. The main

THE BUYERS' LOG BOOK

Soldering iron stand

A DEVICE which keeps soldering irons at the right temperature for use, thus avoiding overheating and the consequent defective soldering, which frequently results in losses sustained by the G.M. Laboratories, Inc., of 1735 Belmont Avenue, Chicago. The stand has two cradles. In the left-hand cradle the iron remains only sufficiently warm to keep it at minimum soldering temperature for standby use. When in actual use it is placed in the right-hand cradle, which has a voltage or rate of current control, so that it is immediately applied to heat it up to the soldering temperature. This device not only keeps the iron ready for use at all times, but is said to effect a saving in operating current. — AVIATION, February, 1933.



and entertainment broadcast bands. The outfit is well contained, including a full dynamic speaker and operates from alternating current. — AVIATION, February, 1933.

Waterproof glue in sheets

BENDING sheets of the viscous fibrous and laminated parts of practically any material known as Tego sheets has recently been introduced in this country by Tego Chemical, Inc., of Zanesville, Ind. The material is a heavy-duty adhesive, which can be applied as required. It is uniform DIB in thick and does not, like other waterproofing materials, require the use of rollers or special equipment. The sheet is completed by pressing the glue together in a hot plate press, without the addition of water or other liquid.

The bond is extremely good and is not subject to deterioration or decay. It does not stain light colors, and the strength is limited only by the strength of the material laminated. For example, steel or wooden boards wet or dry, have shown 100 per cent failure in the usual. But Tego and seams do not equal the bonding material so that it is perfectly flexible to stress and bend Tego bonded joints into curved or irregular forms. — AVIATION, February, 1933.



Low "Radio Kite" airport receiver

Airport receiver

RADIO-KITE, a general purpose radio receiver designed particularly for airports has recently been announced by Radio Development, Inc., of Chicago. The set covers the entire frequency range from 225 to 750 kilocycles, making possible the reception not only of radio beacon signals and airway aircraft distress reports but also covers the Naval communication

electric crank hauling on the motor shaft by means of a simple connecting rod. — AVIATION, February, 1933.

Stainless steel cable

STAINLESS steel control cables for United Navy Specification M-77 and Air Corps Specification 10256 are now being manufactured by the Hazard Wire Rope Company, whose regional offices are at 230 Park Ave., New York. This application in the aerospace field indicates the successful usage of stainless steel tubing for cable craft. Box aircraft and it is available in the 7429 construction in sizes of 1/8, 3/16, 1/4, and 5/16 in. diameters. In addition to being highly resistant to corrosion, this type of alloy steel cable is said to be practically non-magnetic, an important consideration where aircraft wiring runs through magnets in the neighborhood of magnetic compasses. — AVIATION, February, 1933.

Oil-proof hose

RUBBER tubing that has, at all times, proved to be a new construction—oil-resistant D-15—has recently been announced by the Manhattan Rubber Manufacturing Division, Phoenix, N. J. Here listed with the G.O.P. compound, either in raw form, or combined with oil-resisting rubber is proportioned depending on the requirements of service, is said to be entirely unaffected by petroleum derivatives. It is used for gasoline supplied to the carburetor on certain automobiles, and also for fueling and exchange connections for various oil storage and delivery systems. — AVIATION, February, 1933.

Bench grinder

BLACK & DELAPACK and the Van Dusen Electric Tool Company have recently announced a new 6-in. electric bench grinder, which is both compact and portable. It is especially furnished with two grinding wheels with fast-turning coarse and fine flutes. Two adjustable and over-see in hand guards make it possible to grind a variety of angles at any position on the circumference of the wheel. These tools are regularly furnished with a 115 volt 50-60 cycle single phase AC motor. — AVIATION, February, 1933.

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2nd. Irene MacCloskey
3rd. Helen Finkle
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1st. Ray Stangall
2nd. J. Lee
3rd. Eugene Deemer

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When 80,000 spectators at the Army-Navy game at Philadelphia watched sky ad. banners flying in the sky, they witnessed just another example of the wide variety of practical new services made possible by the Autogiro. . . . An advertising sign in the sky which might at first seem a stunt is obviously just as practical as any other form of outdoor advertising but with the added value of spectacular visibility. Many advertisers have been quick to utilize this great new medium. . . . New Autogiro services include forest patrol, pipe line and power line patrol; bandit patrol; exploration; greatly facilitated aerial survey and photography; and the last grows apace.



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ATLANTIC WHITE FLASK

AUTOGIRO NEWS

LONDON, ENGLAND. Juan de la Cerna, made a fellow of the Royal Aeronautical Society during 1932, is awarded the Silver Medal by the Society for "infinite ornamental advances he has made with the aircraft of his invention"—the Autogiro.

LOUISHAMPTON, PA. State police call upon an Autogiro from Pittsboro Field to join in a statewide search for bandits who robbed a bank in this town, revealing that Autogiro search directly produced the culprit in a previous robbery at a nearby center.

CHARLOTTE, N. C. During exercises inaugurating the start of air mail service between Augusta, Ga., Camden, S. C., Columbia, S. C., and this city, the Mayor of the four cities witness an Autogiro aerobatic exhibition by Pilot John Miller. Immediately reporting Autogiro rides, they are awarded extended flights over Charlotte, give willing testimony to "a new sensation of security in flying."

PARIS, FRANCE; BERLIN, GERMANY. Autogiro all exhibitions in these cities reveal European Autogiro developments in the presence of several new experimental models of varied types.

A standard size, 35 millimeter sound film, which graphically tells the story and portrays the performance of Autogiro aircraft, is available for loan without cost for theatre and club use. Write to this company on your business letterhead concerning the picture "Wings of Tomorrow."



Lockheed leads again! The new 1933 Lockheed Orion will cruise at 200 m.p.h., with a full payload of 1172 lbs. A combination of the new Wasp S1D1 engine, improved wing filleting, redesigned tail surfaces, plus the proven Lockheed streamlining and retractable landing gear gives the ORION this new, great advantage --- still the world's fastest commercial airplane. Lockheed Aircraft Corporation, Burbank, Cal.

Lockheed Orion from above
shown in left-hand position with
wing and gear.

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of how vast resources, high spirit of craftsmanship, and far-sighted vision may all be inspired by a single idea—a determination to produce "the best."

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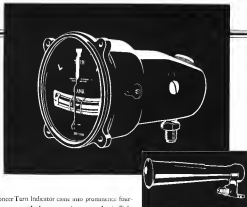
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Although the principles of operation remain the same, many changes and refinements of design have taken place to increase its efficiency and performance. The Pioneer Turn Indicator continues as heretofore to be the one indispensable instrument for Blind Flight.

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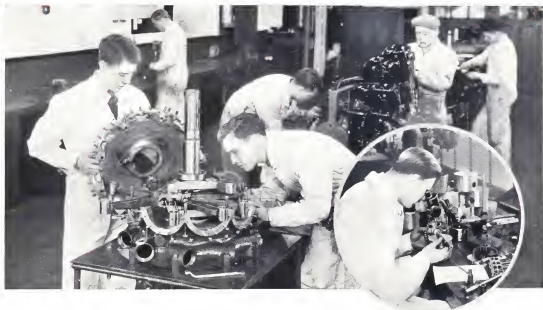
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